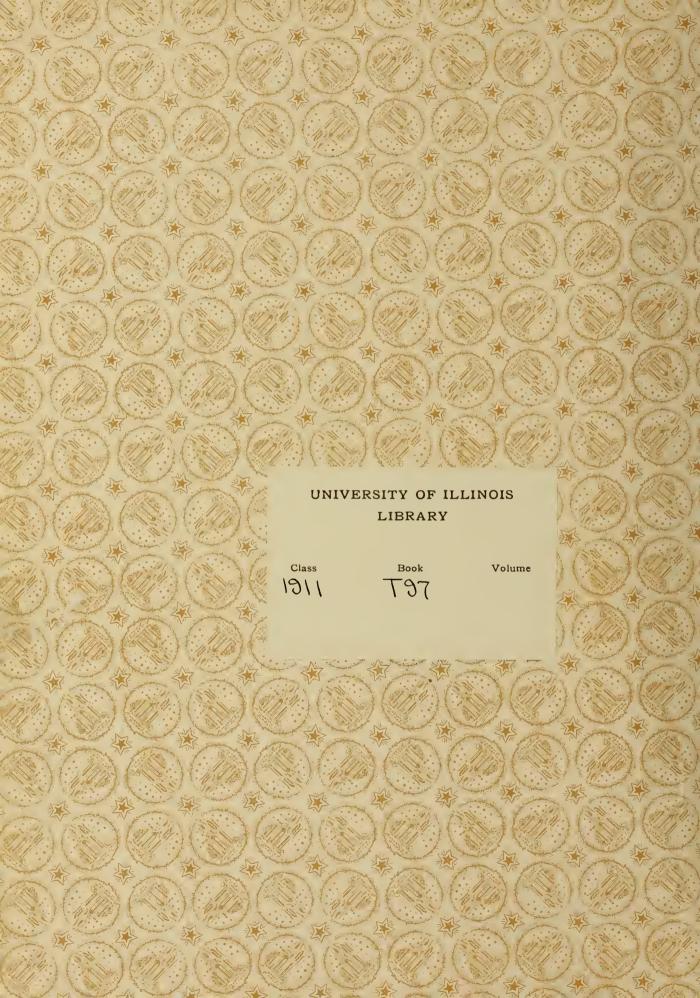
TYLER

A Study of Concrete Mixers

Civil Engineering

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A STUDY OF CONCRETE MIXERS

BY

CHARLES VERNON TYLER

THESIS

FOR THE

DEGREE OF

BACHELOR OF SCIENCE

IN

CIVIL ENGINEERING

IN THE

COLLEGE OF ENGINEERING

UNIVERSITY OF ILLINOIS

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UNIVERSITY OF ILLINOIS

May 25, 1911

I recommend that the thesis prepared under my supervision by CHARLES VERNON TYLER entitled A Study of Concrete Mixers be approved as fulfilling this part of the requirements for the degree of Bachelor of Science in Civil Engineering.

Instructor in Civil Engineering

Recommendation approved:

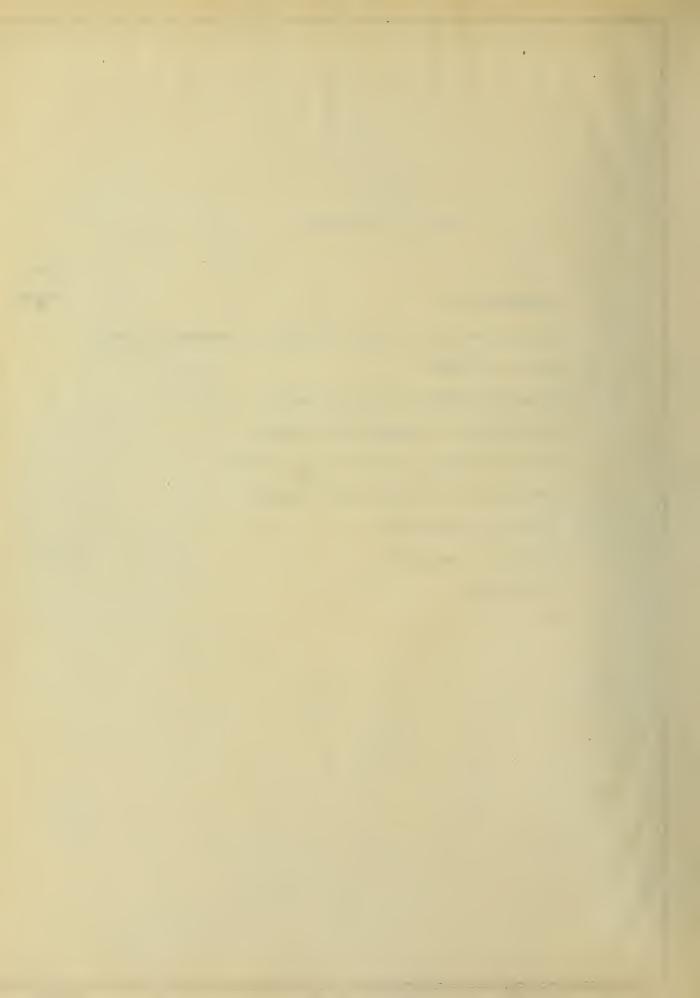
Fra O. Baker.

Head of the Department of Civil Engineering.



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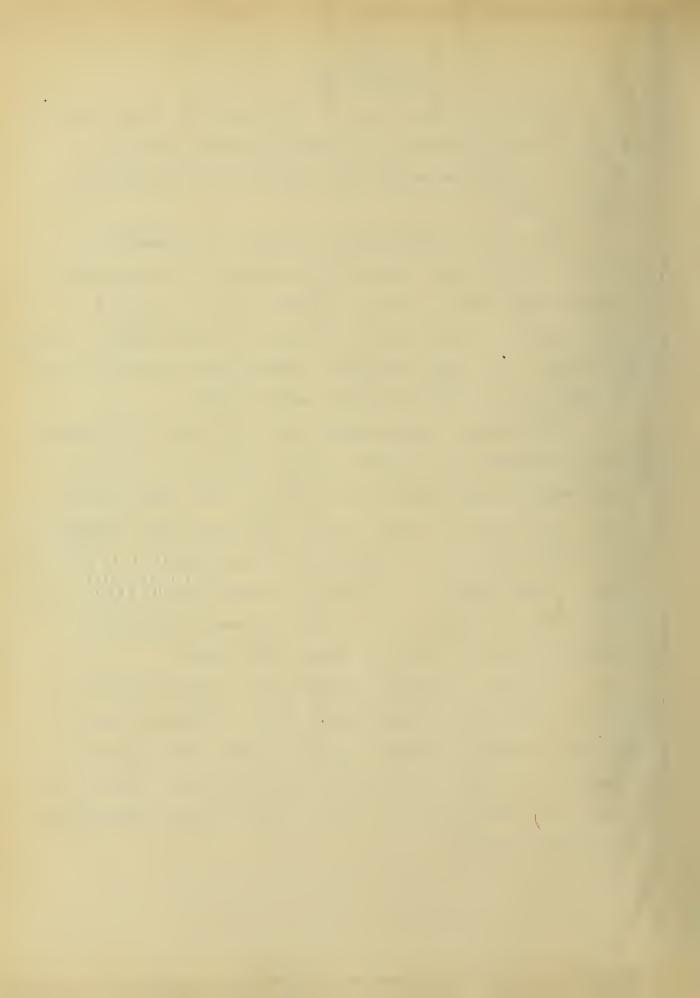
INTRODUCTION.

Concrete, although its use has been know to the building world for many centuries, has taken its position among the foremost building materials only within the last fifteen or twenty years.

The plan of strengthening concrete by the addition of steel reinforcement has made it possible to use concrete almost anywhere that masonry or lumber could be used. Not only sidewalks, foundations, piers etc., are now built of concrete, but bridges and entire buildings, intermediate floors and roof included, are constructed of the same material.

with any proportion of cement and any combination of a particular sand and aggregate, is that in which the cement paste fills the voids of the sand and the resulting mortar fills the voids in the coarser aggregate. Thorough mixing is a more important factor in producing the best concrete than proper proportioning. Every grain of sand and every fragment of aggregate should be entirely coated with cement.

At first, concrete was mixed upon a tight platform or in a shallow box, by men using shovels. This is known as the hand process of mixing. As the building world demanded concrete in larger quantities, it became necessary to mix it faster and cheaper and this necessity led to the invention of the concrete mixer.



In 1850 Frederick Ransome built the first mixer for use in the manufacture of Ransome stone, the fore-runner of the concrete of the present day. This machine was a crude affair consisting of a stationary cylinder within which was rotated a shaft carrying two rows of cross-arms.

The next machine consisted of a shallow pan in which two vertical wheels were driven. These wheels turned on their own axles and also traveled in a circle around the center of the pan. This machine mixed a fine wet mixture very well but was adapted to no others.

with the introduction of Portland cement and larger aggregate, came the demand for a mixer designed for heavy duty. The next type was a long inclined hexagonal drum.

There was no mechanism about this type nor were there any deflectors. The operation of mixing depended solely upon rolling contact.

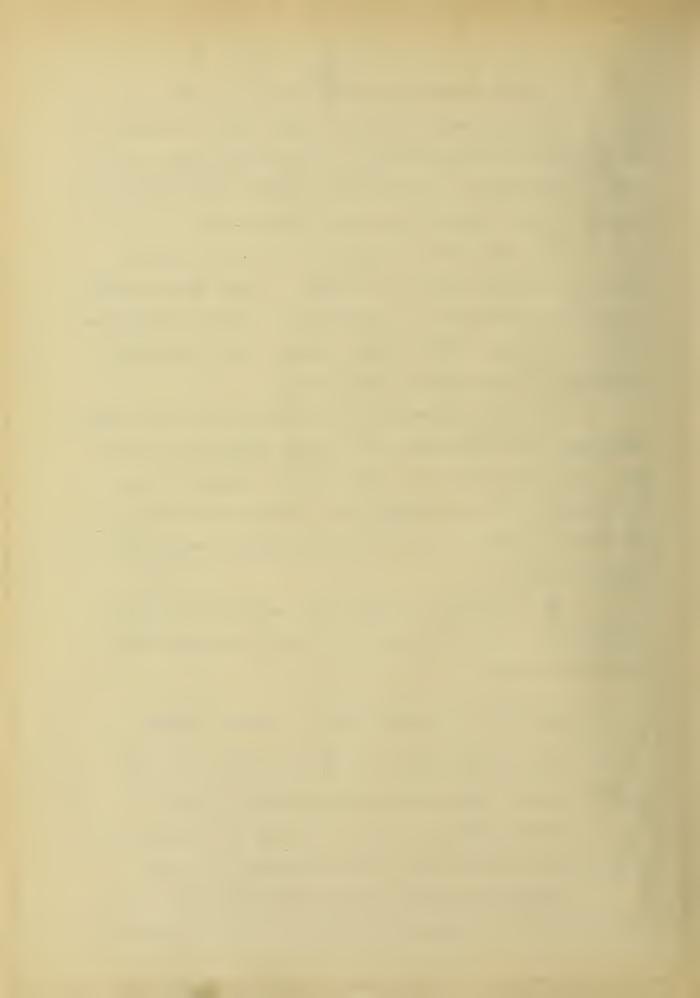
The type which followed this consisted of a revolving box. It is the type from which the modern batch mixer has evolved.

CLASSIFICATION OF MODERN TYPES OF CONCRETE MIXERS.

Modern concrete mixers may be divided into two general classes, batch mixers and continuous mixers.

Batch mixers are those into which the measured ingredients are placed, mixed and discharged as one mass.

Continuous mixers are those into which the ingradients are fed continuously and from which the concrete



flows in a steady stream.

There are three types of batch mixers, - gravity, revolving drum and cube.

Gravity mixers are made stationary. The materials are put in at the top and flow by gravity through the mixer and out at the bottom. Theoretically at least, the mixers are so shaped that the concrete is thoroughly mixed when it comes out at the bottom.

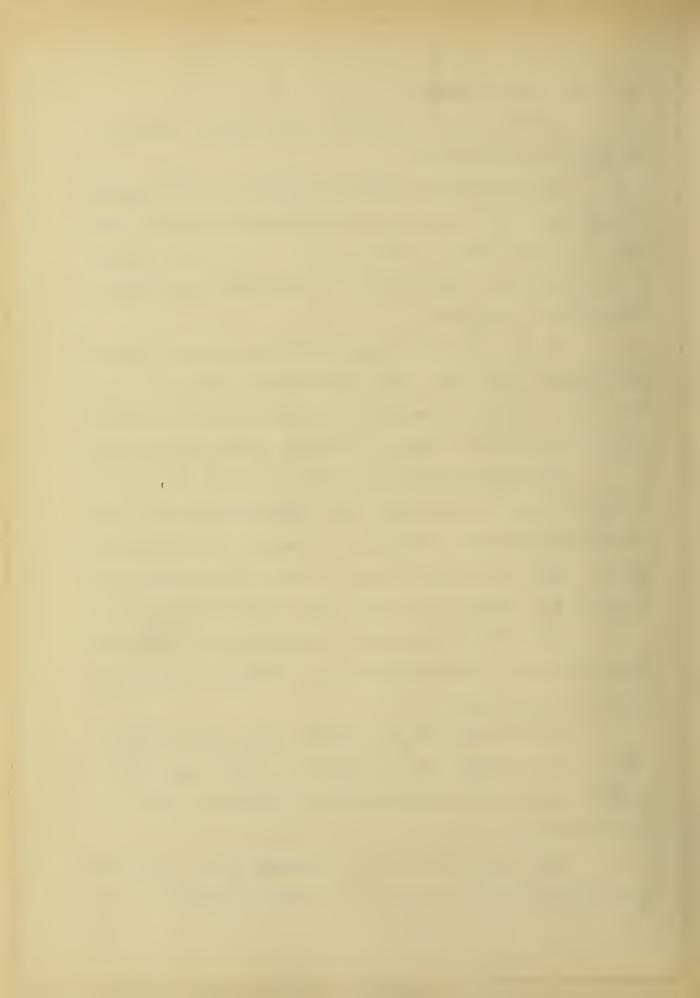
By far the largest number of batch mixers belong to the revolving drum type. The materials are placed in the drum, which is usually equipped with projections or shelves on the inside and the drum is revolved to mix the materials.

The cubical mixers work on a principle very similar to that of the revolving drum type. The form of the barrel makes it unnecessary, however, to place any shelves on the inside. This is a very desirable feature since these projections are likely to make the barrel hard to clean out.

According to the method of discharging, revolving drum mixers and cubical mixers may be divided into tilting and non-tilting styles.

In the mixers of the tilting style, the barrel is hung in a frame which can be tilted by a lever or a system of gearing, allowing the mixed product to flow out of the discharging door.

The non-tilting style is equipped with a discharging chute which can be so placed as to catch the concrete as it



is carried up and dropped, and lead it out of the barrel.

Continuous mixers are all similar in principle although they may vary considerably in details. These mixers consist of four essential parts: feed hoppers, automatic proportioning and feeding device, mixing device and some sort of power.

The feed hoppers are three in number, one for cement, one for sand and one for crushed stone or gravel. They are usually built of metal and placed in a position as convenient as possible for loading and for feeding the proportioning device as well.

There are various forms of automatic proportioning and feeding devices, which fall under five general types viz: First, a worm feeding device. Different proportions are obtained by changing the speed of the worm and the size of the opening in the feed hoppers.

Second, an endless belt conveyor placed below the hoppers, the materials dropping upon it through openings in the bottoms of the hoppers. The proportioning is accomplished by adjusting the size of these openings.

Third, a pocket device consisting of two pockets for each hopper, which have a reciprocatory movement, one filling while the other is emptying.

Fourth, revolving pocketed steel cylinders, the proportioning being accomplished by adjusting the size of the pockets.



Fifth, plungers which work back and forth, pushing forward the same amount of material at each stroke.

LIST OF MIXERS.

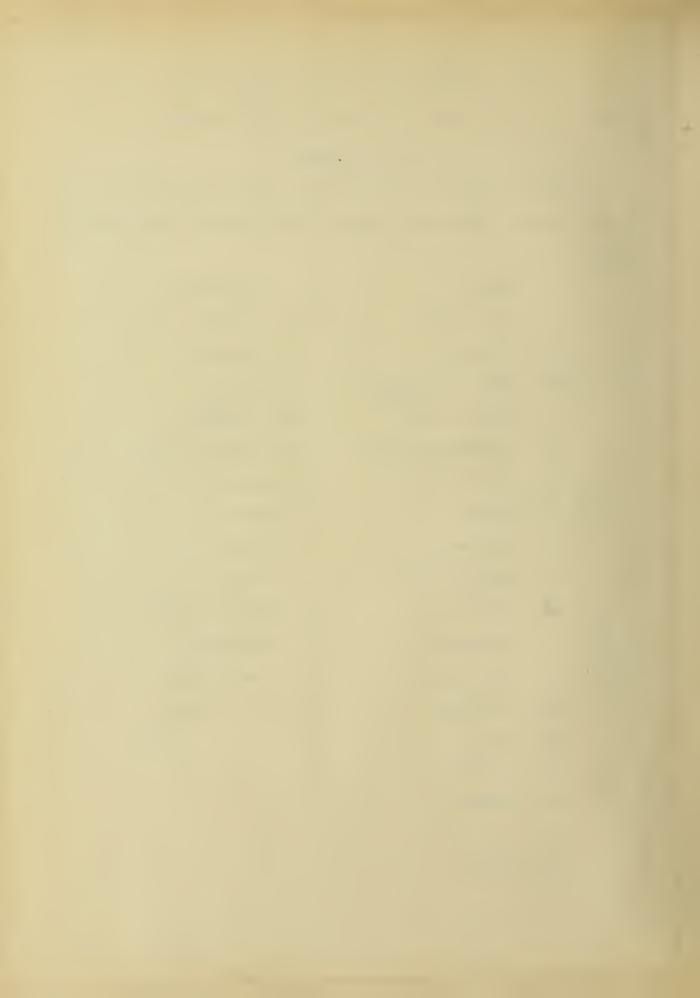
The mixers in this list are considered by the writer to be the most successful mixers on the market at the present time.

Batch

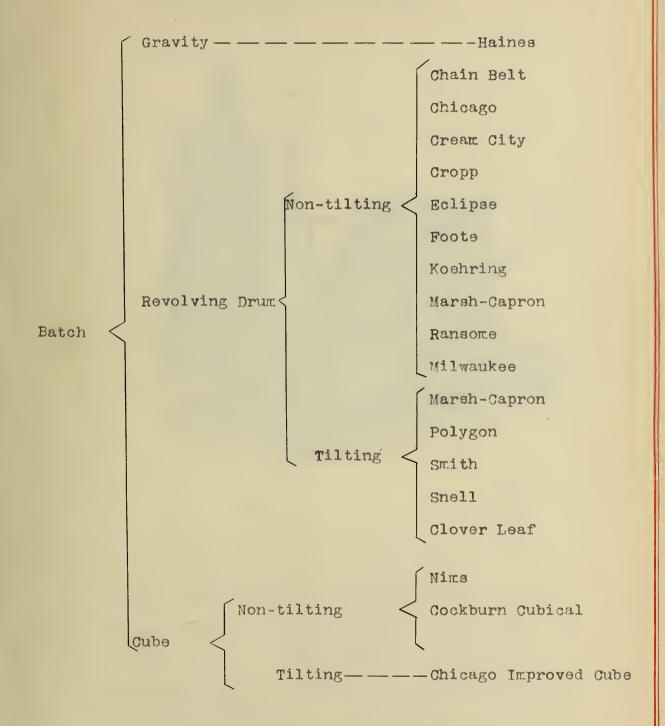
- 1. Chain Belt
- 2. Chicago
- 3. Chicago Improved Cube
- 4. Clover Leaf
- 5. Cockburn Cubical
- 6. Cream City
- 7. Cropp
- 8. Eclipse
- 9. Foote
- 10. Haines
- ll. Koehring
- 12. Marsh-Capron
- 13. Milwaukee
- 14. Nims
- 15. Polygon
- 16. Ransome
- 17. Smith
- 18. Snell

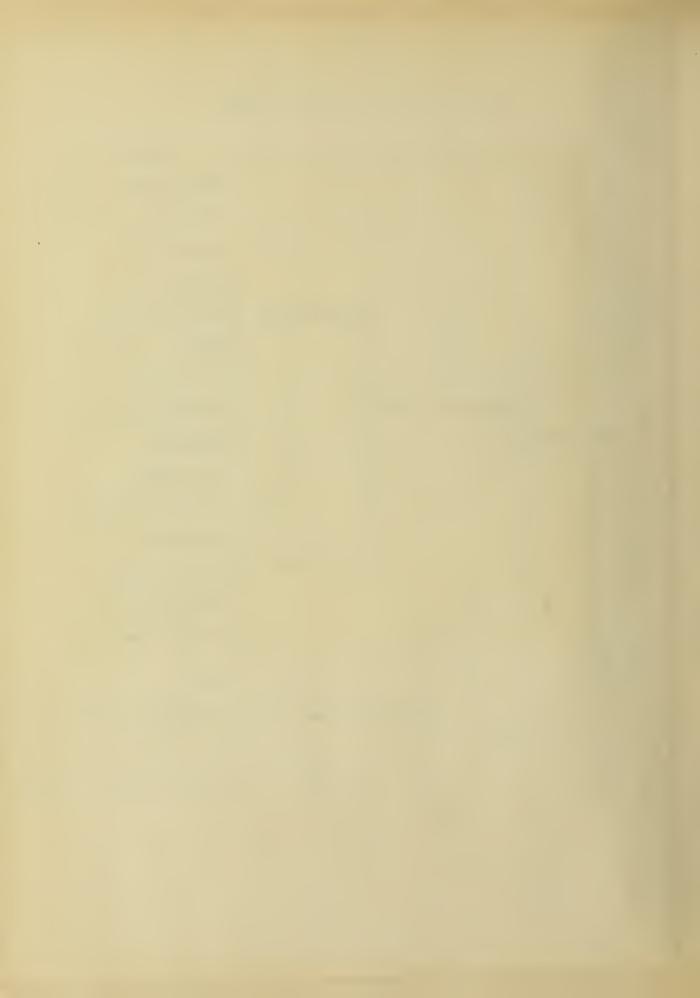
Continuous

- 1. Advance
- 2. Cockburn
- 3. Coltrin
- 4. Crescent
- 5. Eureka
- 6. Foote
- 7. Gauntt
- 8. Grand
- 9. Kent
- 10. Miles Simplex
- 11. National
- 12. Perfection
- 13. Systematic



CLASSIFICATION OF BATCH MIXERS.





DESCRIPTIONS OF INDIVIDUAL MIXERS.

CHAIN BELT.



Chain Belt Concrete Mixer

On Steel Trucks equipped with Steam Engine, Boiler and Standard Hopper

The Chain Belt Mixer is a batch mixer of the non-tilting style. The drum is cast in two sections bolted together. Its interior is equipped with four diagonal blades and four elevating buckets. The drum is driven by a steel bushed roller chain belt which, it is claimed, requires less power than gearing.



The Chain Belt Co., Milwaukee, Wis. are the manufacturers.

Price

No.	Capacity cu.ft. loose material	Cu. yds. concrete per hr.	St. Eng. and Boiler	Gas.Eng.	Motor
1	12	10	\$ 775.00	\$ 855.00	\$ 775.00
2	20	15	950.00	1100.00	950.00
3	30	22 <u>1</u>	1125.00		1125.00

CHICAGO



No. 10 Chicago Mixer on steel truck with steam power.

The Chicago Concrete Mixor is a batch mixer of the non-tilting or discharge chute type. The drum is a cylinder with four deflecting surfaces or inclined planes placed in opposing sides thereof. There are four lifting blades placed



in pairs. By means of the inclined planes the material is continually thrown from side to side of the drum as well as folded and refolded in the plane of rotation. The drum is driven by heavy gearing.

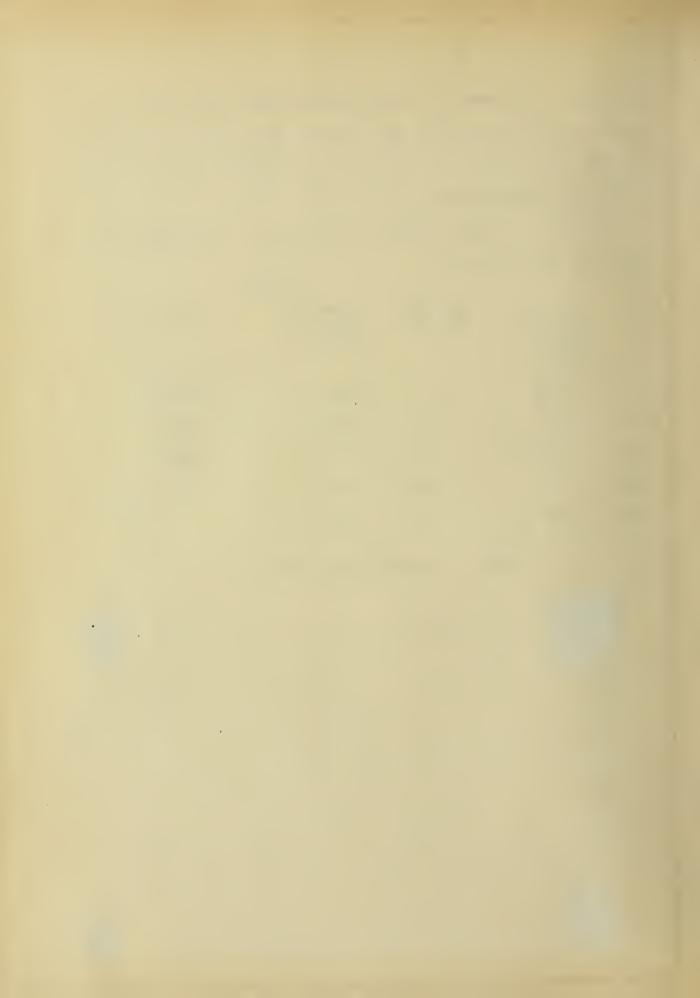
The Chicago Concrete Machine Co., Milwaukee, Wis. are the manufacturers.

P	r	i	C	9

No.	Capacity Cu. ft. loose material	Cu. Yds. per hr.	St. Eng. and boiler	Gas Eng.
5	$4\frac{1}{2}$	5	\$ 440	\$ 375
10	10	10	565	615
14	$14\frac{1}{2}$	$16\frac{1}{2}$	715	835
23	23	24	835	1020
30	30	32	1010	

CHICAGO IMPROVED CUBE MIXER.





This is a cubical batch mixer of the tilting type. The drum which is designed with carefully rounded corners, revolves about an axis passing through diagonally opposite corners. This axis is formed by hollow trunions which rest upon rollers. The hollow trunions serve as openings for charging and discharging the mixer. The shape of the drum and the manner in which it is hung produces a motion which folds the concrete upon itself laterally as well as in the direction of rotation. Municipal Eng. and Cont. Co., Chicago, Ills. are the manufacturers.

			Price	1
No.	Capacity in Cu. ft.	Cu. Yds. per hr.	St.Eng. & Boiler	Gas Eng.
Handy	2 <u>1</u>	3		
6	6	8	\$ 590	\$ 590
11	11	15	845	845
17	17	25	1250	1250
22	22	30	1600	1600
33	83	45	2000	2000 .
64	64	75	4000	4000



CLOVER LEAF.



Portable "Clover Leaf" Mixer with Engine Housed

This is a batch mixer of the tilting drum type.

It takes its name from the peculiar shape of the drum. The drum is made up of three curved sections riveted together.

The material is mixed, cut through and folded over without the use of any projecting shelves or deflectors on the inside.

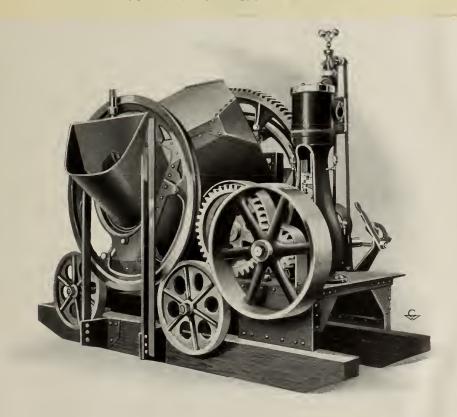
This makes it practically impossible for any concrete to adhere to the interior of the drum.



Clover Leaf Machine Co., South Bend, Ind. are the manufacturers.

No.	Capacity Cu. ft.	Cu. Yds. per hr.	St. Eng. & Boiler	ice Gas.Eng.
5	5	3	\$ 475	\$410
7	7	5 1 2	610	535
10	10	8	750	660
15	15	18	8.50	850

COCKBURN CUBICAL CONCRETE MIXER.



Charging Side with Charging Chute

This is a batch mixer, cubical as the name implies, and of the non-tilting type. It is well built and the gears and bearings are very heavy. The drum revolves on large anti-



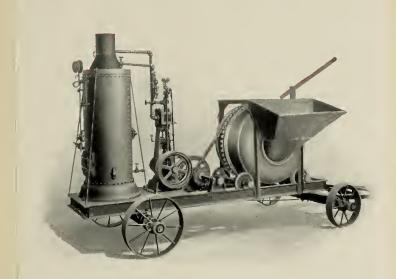
friction rollers. These rollers are provided with chilled faces to resist wear and their shafts run in metal bearings, provided with dust shields. The bed frame consists of side timbers of wood to which a steel squaring frame and tie plates are rigidly fastened.

Cockburn Barrow and Machine Co., New York, N.Y. are the manufacturers.

No.	Capacity Cu. ft. Material	Pri St. Eng. & Boiler	ce Gas Eng.
15-9	15	\$710	\$ 685
20-14	20	900	800
30-21	30	1165	990
40-27	40	1480	1230
80-54	80	2065	1840



CREAM CITY.



CREAM CITY CONCRETE MIXER

This is a non-tilting, revolving drum, batch mixer.

The drum is driven by a center chain belt drive and revolves on large rollers which are placed back from the edge of the drum to avoid dirt or any foreign material lodging upon them.

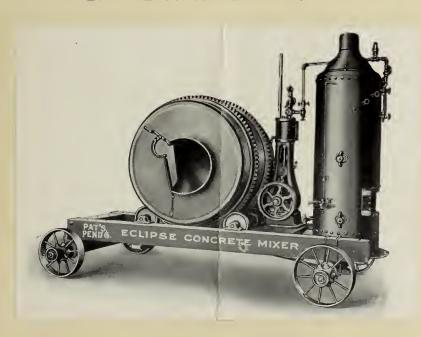
The frame is made entirely of steel and as light as is warranted by security. The mixer is mounted low which is a desirable feature.



The Cream City Equipment Co. Milwaukee, Wis. are the manufacturers.

No.	Capacity Cu. ft. mat.	Cu. Yds per Hr.		St.Eng. & Boiler	Price Gas Eng.
0	6	6		\$ 455	\$ 435
1	12	20	800	800	880
1 1/2	16	25	900	880	970
2	20	30	1000	1000	1150
4	45	60	1725	1745	

ECLIPSE CONCRETE MIXER.



The Eclipse Concrete Mixer is a batch mixer of the non-tilting, revolving drum type. The drum which revolves on large bearings is driven by two sets of gears. The frame is built of wood bolted together with heavy bolts.



The method of charging is a distinctive feature of this machine. A low charging platform about 24 inches high, forms part of the truck. There is no charging hopper, the material being wheeled upon the platform and dumped into the open end of the drum. A series of charging blades carry the material toward the center of the drum and make it unnecessary to have an end in the drum on the charging side. Blades are so arranged within the drum that the material is continually shifted from center to outside and back, as well as being turned over upon itself by the revolution of the drum.

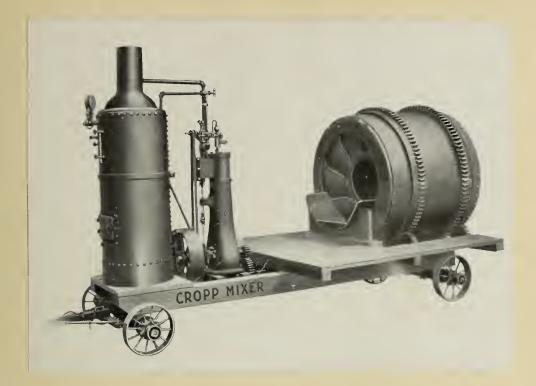
The most objectionable feature of this mixer is the comparatively large number of blades.

The Standard Scale and Supply Co., Chicago, Ills. are the manufacturers.

No.	Capacity Cu. ft. Mat.	Cu. Yds	St.Eng & Boiler	Price . Gas Eng	Motor
8	4 1/2	5	\$440	\$395	\$390
10	7	8	540	530	520
11	10	10	620	610	600
12	15	15	690	660	640
13	20	80	850	ė 3 0	800
14	30	25	980	930	1000



CROPP.



The Cropp Concrete Mixer belongs to the non-tilting style of revolving drum batch mixer. A feature of this machine is the extremely low truck, the top of the frame being only 20 inches from the ground.

The drum, which revolves in a plane perpendicular to the longitudinal axis of the truck, is mounted at one end of the truck and the engine at the other. A platform is placed over the trucks. The material is wheeled upon this platform and dumped into the low charging hopper from where it is drawn into the drum by means of receiving blades.

The mixer is extremely low charging, and saves lifting all the material above the center of the drum as is the
case in most mixers of this type.



The mixing is effected by the action of a V-shaped blade which throws the material toward the sides, and by blades at the sides which throw it back toward the center as the drum revolves.

The discharge chute is considerably higher than the charging hopper which is a good feature.

The drum is driven by two sets of gearing and revolves on four roller bearings.

Cropp Concrete Machinery Co., Chicago, Ills. are the manufacturers.

No.	Capacity	Price	Oth Dwg
	Cu. Ft. material	Gas Eng.	St. Eng. & Boiler
0	7	\$375	\$425
1	10	475	485
2	15	570	570
3 .	20	700	700
4	30	900	900
5	40	1000	1000



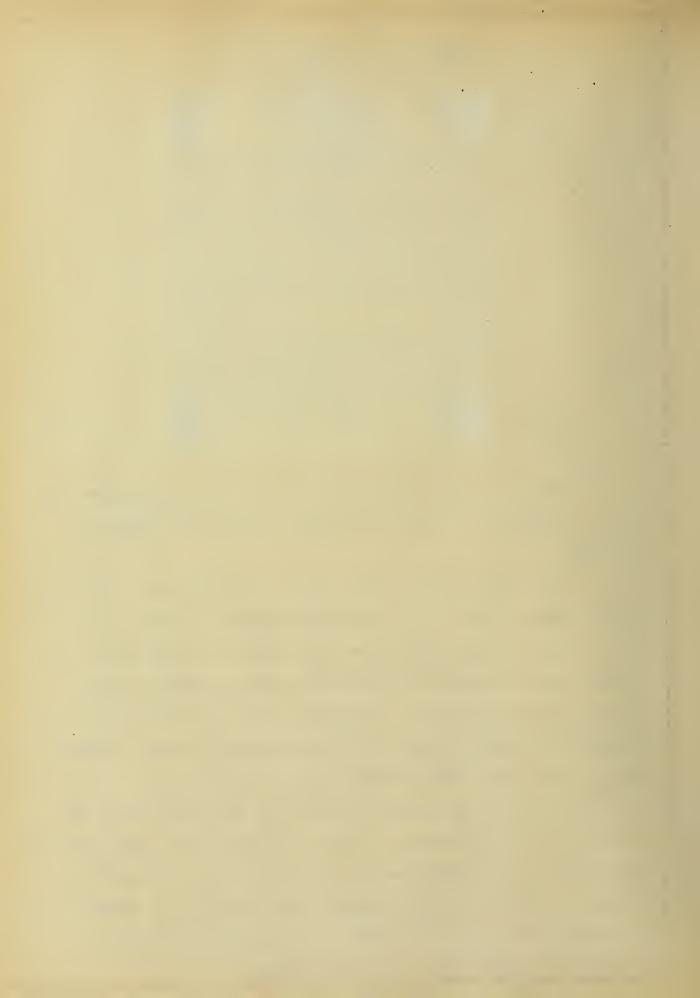
FOOTE BATCH MIXER.



This is a mixer of the non-tilting, revolving drum type.

It is extremely well made throughout, being built entirely of steel.

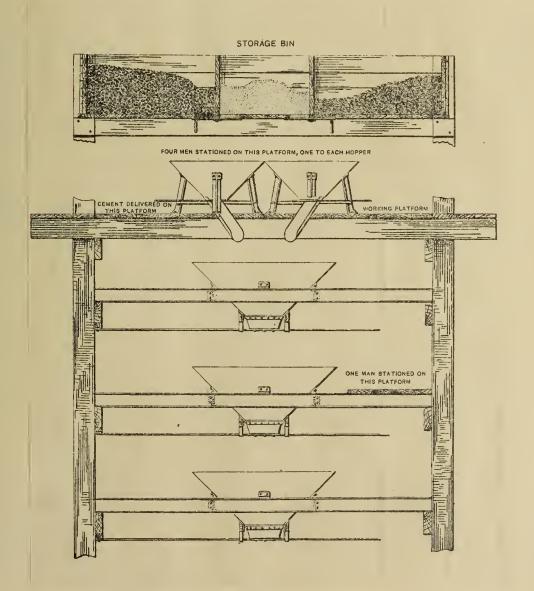
The drum is made in the form of a double cone put together at an angle of 45° , with the angle rounded at the inside. It is made of heavy sheet steel set into cast iron heads. On these heads are cast the drum gears and the flanges upon which the bearings turn. The shape of the drum makes it possible to hang it rather low by letting the middle project down between the frames within a foot of the ground. With the stationary charging hopper, the material has to be raised $\frac{3}{4}$ of the distance to the top of the drum. The shape of the drum is very effective for good mixing and the number of wings is reduced for that reason. Drum friction is reduced to a minimum by means of four 22 inch rollers each having a bearing 6 inches wide, lined with bronze.



The Foote Mfg. Co., Nunda, N.Y. are the manufacturers.

	Capacity		Price	€
No.	Cu. ft. Loose Material	'Cu. Yds.per hr	. Gas Eng.	St. Eng. & Boiler
5	13	10	\$850	\$825
6	22	15	1050	1025
7	40	20	1350	1275

HAINS.



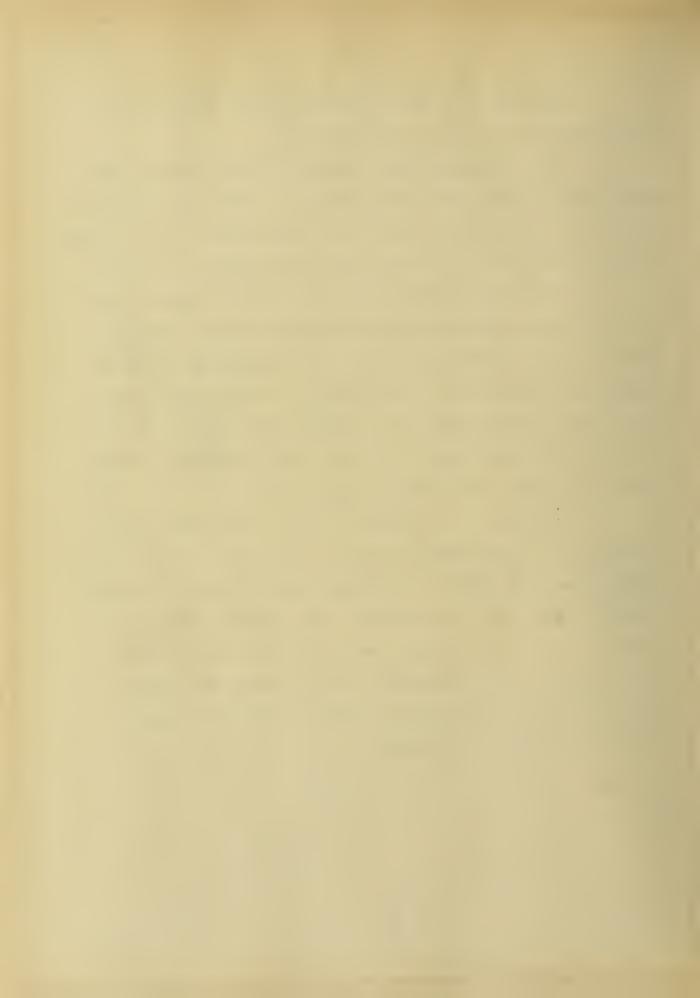


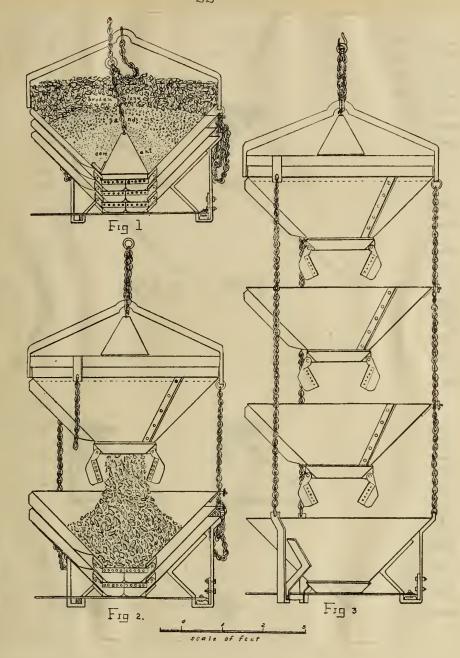
There are two types of Hains gravity mixers, the stationary type and the telescope type.

The stationary mixer consists of two or four small top hoppers placed upon a frame support. This frame carries also three large hoppers placed one below another, all of them being directly below the discharge spout of the top hoppers.

The upper platform upon which the top hoppers are set, is large enough to hold considerable material and allow room for two or four men to work, the number of men corresponding to the number of top hoppers. A storage bin may be built over the top hoppers and divided into compartments for sand and stone which can be fed into the top hoppers through orifices in the bottom of the compartments.

The cement is first put into the top hoppers and leveled off. The gravel or crushed rock is put on top of the sand. When both gravel and crushed rock are used, the gravel is put in first and leveled off. The required amount of water is then sprayed evenly over the top of the material, all of which becomes thoroughly wetted except the cement. The cement is wet upon the top surface only as the water does not penetrate the powder.





The gates of the top hoppers are all opened at once, the material passing through contracted orifices to the hopper directly below, where they are held. When the top hoppers are empty the gate of this next hopper is opened, the same operations being repeated until the concrete passes through the bottom hopper and is ready to be put into place.



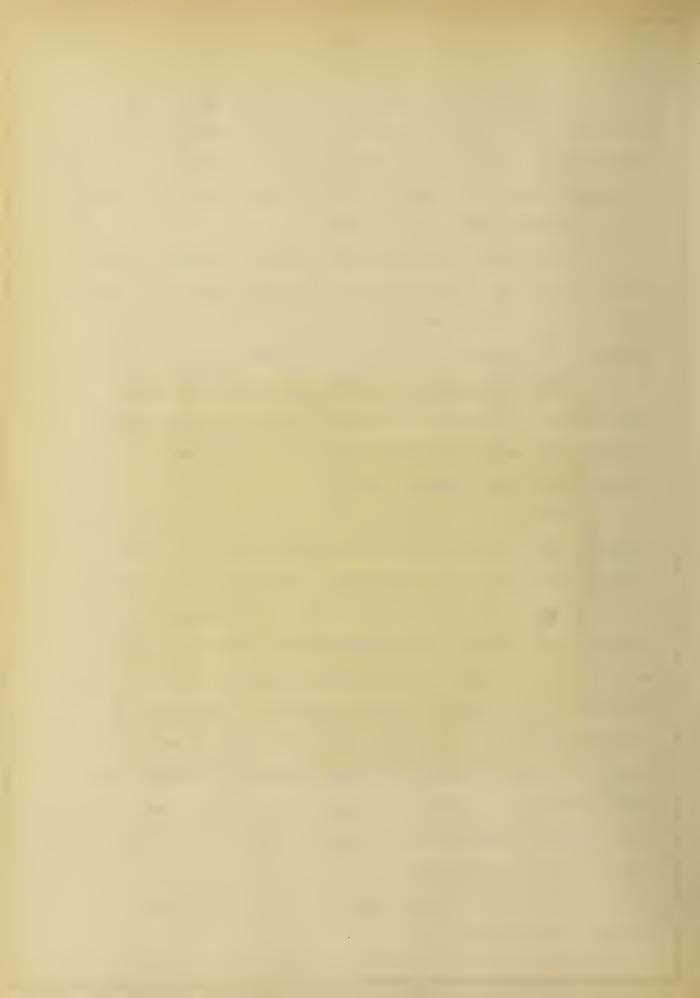
The mixing is effected by the principle of the hour-glass. The material above the orifice runs out of the hopper first while the rest of the material slides over itself in passing out. The batch is really turned inside out three times in passing through the mixer.

The Hains stationary mixer is well adapted for use on work where the material can be delivered about on a level with the top platform and where the concrete is to be used at about the elevation of the bottom hopper or below it.

The telescope type works upon exactly the same principles. It however, is adapted for use on level ground or under the same conditions where other batch and continuous mixers are commonly used.

Four hoppers, which are built to fit one inside of another, are suspended from the boom of a derrick. The hoppers are lowered and telescoped and the top one charged as in the case of the stationary type. The hoppers are then raised by the derrick and swung directly over the place where the concrete is to be finally deposited or where it is wanted for distribution, the gates opened in turn and the mixing accomplished as before. The fact that no power is needed in connection with the Hains mixers make them a very economical type. As there is practically no machinery to wear out, they should be much longer lived than the common type of power-driven mixer.

The Hains Concrete Machinery Co., Washington, D.C. are the manufacturers.



	Capacity	Price
	Cu. ft. per batch	
Stationary	1 1/2	\$1250
Stationary	1	900
Telescope	$\frac{2}{3}$	500

MARSH-CAPRON.



The Marsh-Capron revolving drum, batch mixer is made in two styles, the tilting and the non-tilting.

The non-tilting type is equipped with a cylindrical drum of semi-steel, cast in two sections. The blades and buckets within are of the usual style. Distinctive features



are the rail-track trunions which run on car-wheel bearings, and the center drive gear which is made in five sections.

No.	Capacity Cu. ft. loose material	Cu. Yds. per hr.	Price St.Eng. & Boiler	Gas. Eng.
0	9	$6\frac{2}{3}$	\$600	\$600
1	14	10	785	785
2,	21	$16\frac{2}{3}$	980	1060
3	30	24	1125	
4	40	30		

Tilting.



The Marsh-Capron tilting mixer is very simple in construction, there being but 29 parts all told.

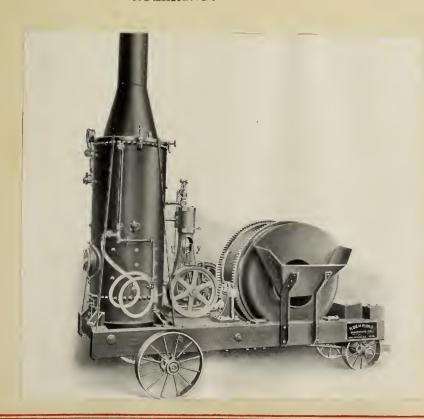
The drum is double cone-shaped and is fitted with peculiarly bent blades.



Ample space is left between drum and blades to allow water to flow through freely. It is supported at the ends in a cradle on 1 inch steel ball bearings. If it is desirable to deliver the product on the opposite side, the drum is easily reversed in the bearings. Marsh-Capron Mfg. Co., Chicago, Ills. are the manufacturers.

	Capacity	Price	•
No.	Cu. ft. loose	Cu. Yds.per hr. St.Eng & Boiler	Gas Eng.
0	7	5 1 \$ 575	\$ 575
1	14	10 745	745
2	21	16 2 930	1010
3	30	23 1 1075	
		3	

KOEHRING.





This is a batch mixer of the non-tilting, revolving drum type. The drum-head, trunion and gear at each end of the drum are one piece of cast iron. Other features are the low trucks, rounded inner corners of the drum and the divided discharge chute. The section of the chute outside the drum is stationary. The section inside tilts down when mixing. To discharge, it is tilted up by means of a lever.

Koehring Machine Co., Milwaukee, Wis. are the manufacturers.

	Capacity		Price
No.	Cu. ft. material	Cu. yds./hr. St.Eng & Boile	
00	4	3	\$ 390 \$ 375
0	7	7 \$ 600	620 580
1	11	14 785	815 760
1 1/2	18	20 915	1005 880
2	22	25 1000	1140 960
3	27	30 1090	1260 1085

MILWAUKEE.





The Milwaukee Concrete Mixer is a revolving drum, batch mixer of the non-tilting type. The drum is spheroidal in shape and made of two semi-steel castings, the sprocket segments being bolted to the flanges by the same bolts which hold the sections of the drum together.

There is not a corner nor an angle in the interior where the concrete can lodge. Three diagonal blades and six discharging buckets assist in the mixing.

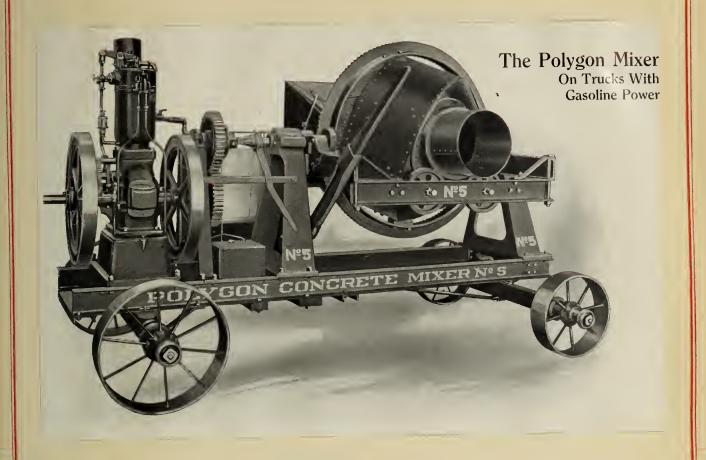
Distinctive features of this mixer are the center chain belt drive, and the position of the trackers near the center of the drum. The trucks are all steel. The rollers are 16 inches in diameter and have 12 inch bearings.

Milwaukee Concrete Mixer and Machinery Co.,, Milwaukee, Wis. are the manufacturers.

No.	Capacity Cu. ft. Mat.	Cu. yds/hr.		Price Gas Eng.	Motor
00	5	4	& Boiler	\$ 415	\$ 415
1	12	20	\$800	880	800
1 1/2	16	25	880	970	900
2	20	30	1000	1150	1000
4.	50	\$ 0	1845		1725



THE POLYGON.



This is a revolving drum, batch mixer of the tilting type. Its distinctive feature is the shape of the drum. The drum is polygonal being formed by two truncated cones upon which the cylindrical heads are so placed as to make the original axis of the drum incline 45° to the main axis. On account of this shape the material is thrown backward and forward, endwise of the drum several times for each revolution. Four or six blades on the interior assist in this action.



The drum is driven from the center by a bevel gear.

The trunions are near the ends of the drum as they bear on the cylindrical heads. This is rather a bad feature as sand, gravel and concrete is likely to get on the trunions.

Waterloo Cement Machinery Corporation, Waterloo, Ia. are the manufacturers.

No.	Capacity Cu. ft. loose Material	Cu. yds./hr.	St. Eng. & Boiler	Price Gas Eng.
1 2	7 1/2	5.5	\$640	\$625
ĩ	13	9.0	835	825
2	26	19	1125	1245
3	33	24	1425	
4	50	55	1775	

RANSOME.



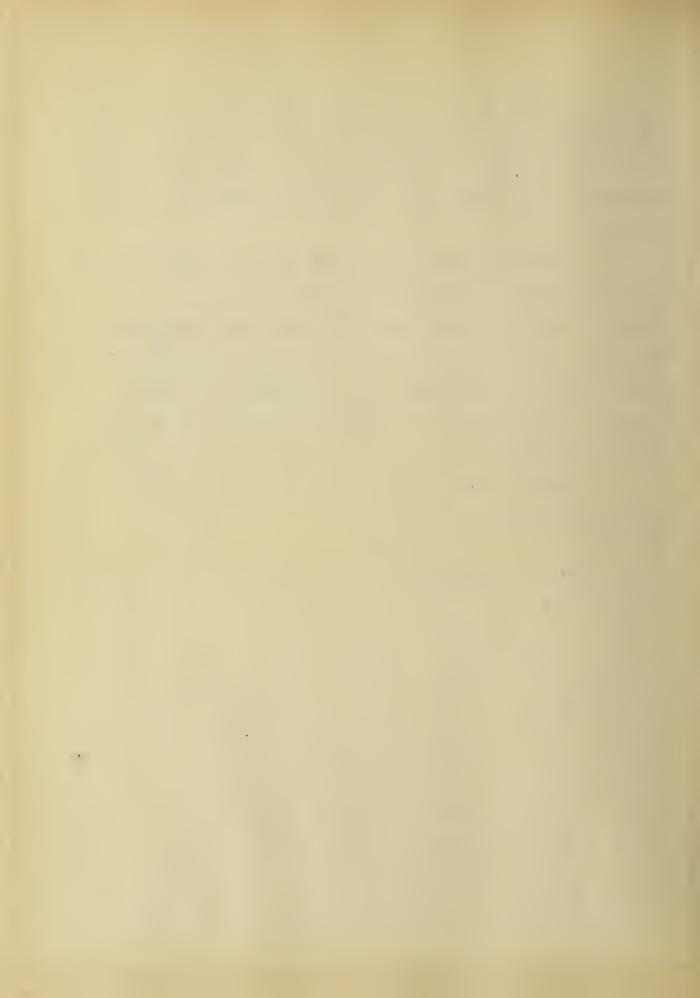


The Ransome is a revolving drum, batch mixer of the non-tilting type. The shape of the drum is cylindrical and there is no attempt to round the corners. This appears to be rather a bad feature as it furnishes a place for material to stick.

The drum is driven by a gear placed in the middle of the drum on Nos. 14, 21, 28, 40 and 80, and at one end on Nos. 4, 7, and 10. The plane ends of the drum offer no obstruction to the flow of materials from the hopper into the mixer but on the other hand they do not cause any endwise movement of the material in mixing, this being left to the deflecting blades alone.

Ransome Concrete Machinery Co., Dunellen, N.J. are the manufacturers.

No.	Capacity Cu. ft. loose	Cu. yds./hr.
4	4	4
7	7	7
10	10	10
14	14	14
21	SI	21
28	28	28
40	40	40
80	80	80



SMITH.



This is a revolving drum batch mixer of the tilting type. The drum consists of two steel cones whose bases are riveted to a central grey-iron ring. This drum rests in a U-shaped steel cradle which is hung by two trunions into uprights called pedestals. The central ring carries the gear teeth of the driving mechanism and furnishes the track for the main and guide rollers.

Opposing sets of blades are riveted to the inner surface of the drum. The power is transmitted by a miter gear upon the main shaft, to a spur-bevel gear upon the cross shaft. The spur of this gear meshes with the gear teeth on the drum. This is an improvement upon a bevel gear drive



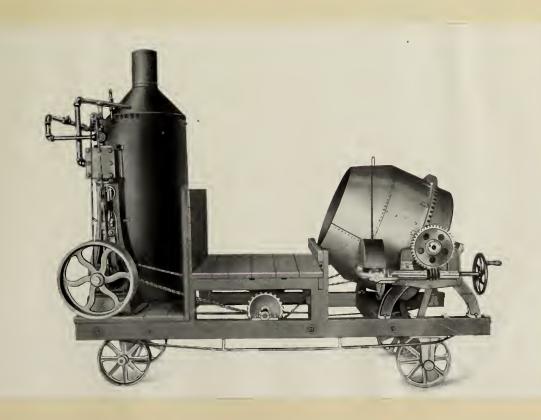
which is affected by the settling of the drum due to wear in the bearings.

The T. L. Smith Co., Chicago, Ills. are the manufacturers.

No.	Capacity Cu. ft. loose	Cu. yds./hr.		rice	
	material	cu. yas./mr.	St. Eng. & Boiler	Gas Eng.	Motor
10	8 1	9	\$615	\$640	\$560
11	$14\frac{2}{2}$	$16 \frac{1}{2}$	780	875	740
12	$24 \frac{2}{1}$	27 1	1085	1285	990
13	33	3 7	1315		1195
* 14	46	52	1135		1340
* 18	92	104	2250		

* On skids only.

SNELL.





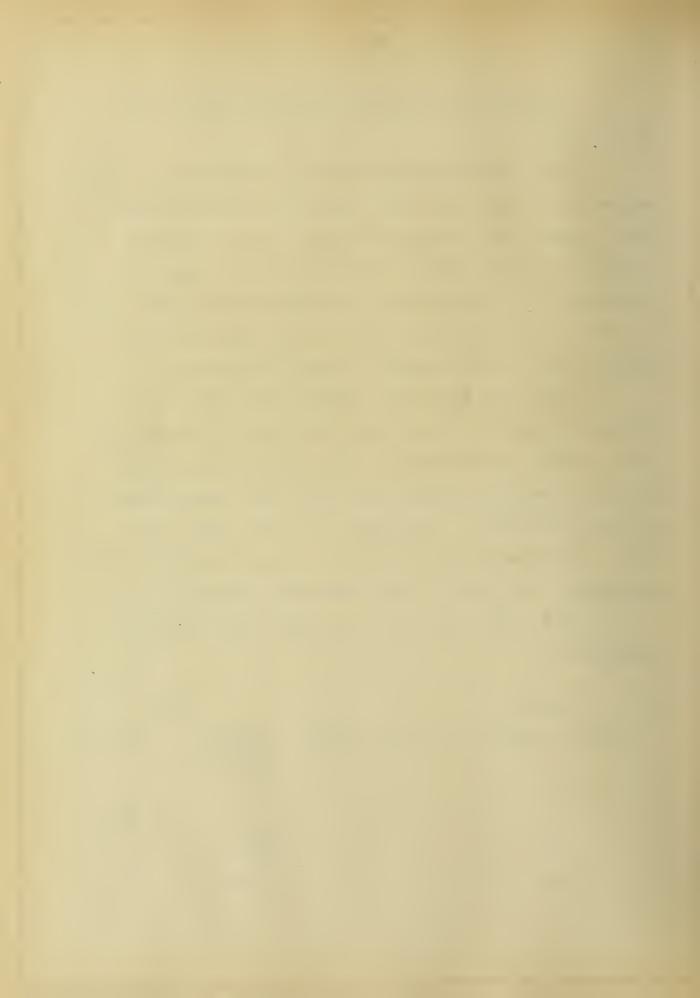
The Snell is a revolving drum batch mixer of the tilting type.

The distinctive feature in the construction of this machine is the open drum. The sides of the drum are sheet steel, mounted upon a cast iron bottom, the driving gear being cast on this bottom. The drum rests upon only one bearing which is a ball bearing made entirely of steel. This bearing is placed under the center of the drum as far as possible from dirt and material likely to get into it.

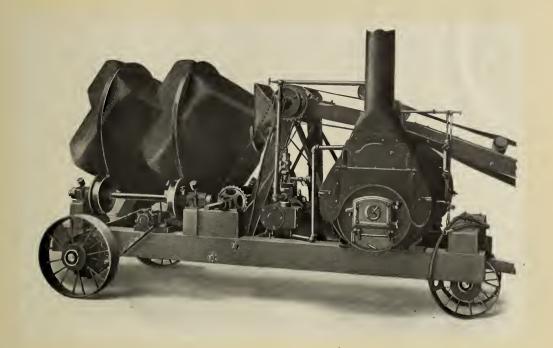
Five small blades are riveted inside the drum in a vertical position. When mixing, the drum is tilted to an angle of 45°. The materials are carried up by the blades and poured over themselves, being folded and kneaded about 100 times per minute. The mixing is in full view at all times. Water can be added until the concrete has the desired consistency. The drum is very easily kept clean.

R. Z. Snell Mfg. Co., South Bend, Ind. are the manufacturers.

No.	capacity		F	Price	
	Cu. ft. concrete	Cu. ft. per hr.	St.Eng. & Boiler	Gas Eng.	
0	2 1	3			
1	7	8		\$400	
2	10	12	\$550	550	
3	18	20	800	800	



NIMS.



The Nims Mixer is a revolving drum, batch mixer of the non-tilting type. It has several distinctive features not found on any other machine. One of them is the automatic measuring device and conveyor by means of which a continuous stream of proportioned material is carried to the drum. The drum consists of two cubes cast in one piece, with an opening from the first into the second. A batch is delivered to the first cube and receives twenty turns after which it is automatically discharged into the second cube. There it receives twenty more turns and is discharged. As soon as one batch passes into the second cube another batch passes into the first cube so that both cubes are mixing all the time. This gives practically continuous batch mixing.



The water is usually added in the second cube although it may
be added in either or both. The inside of the drum does not
nave a rivet or nut in it. There are two discharging shelves
only, which are cast into the drum. The drum is gear driven
The Barron & Cole Co., New York are the manufacturers.

Capacity
Cu. yds. per day

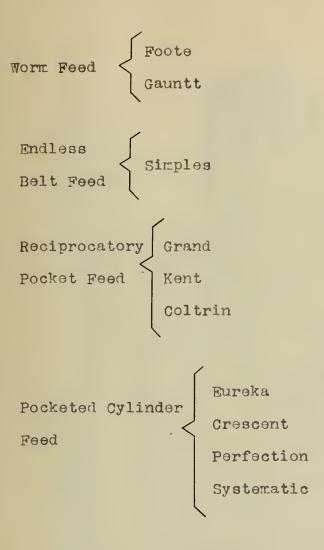
150 - 600

Price St. Eng.

\$2500



CLASSIFICATION OF CONTINUOUS MIXERS.

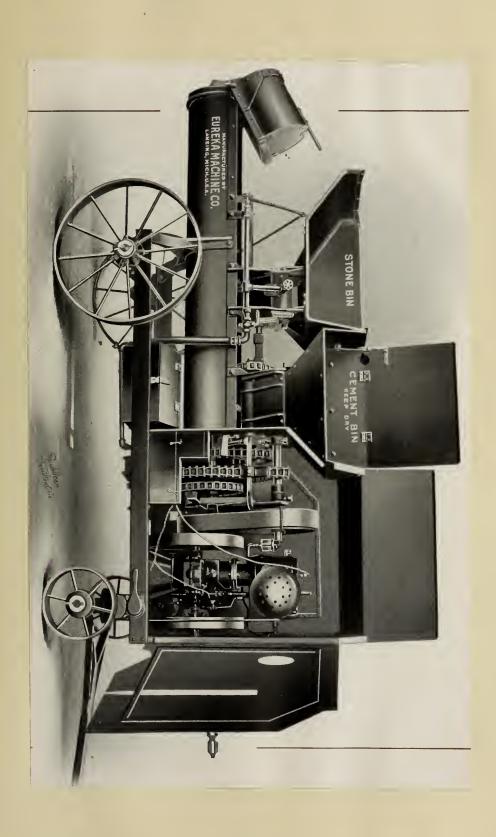


Plunger Feed - National

Note. The Cockburn Continuous Mixer is not equipped with an automatic feed and hence does not fall under any of the heads of this classification.



EUREKA.



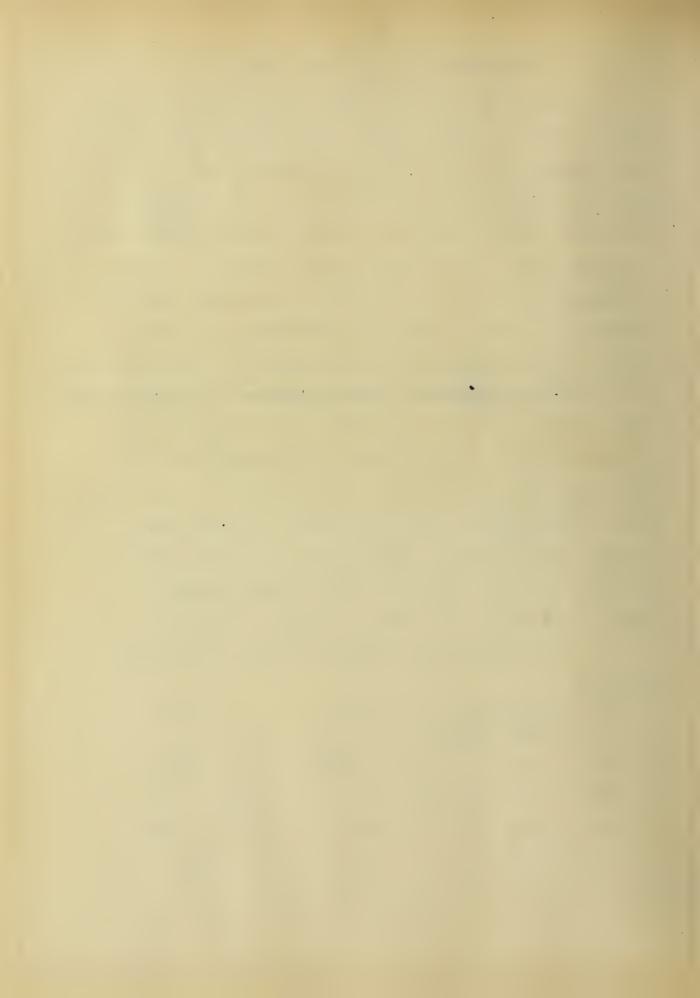


DESCRIPTION OF INDIVIDUAL MIXERS.

The Eureka Continuous Mixer has the pocket cylinder type of automatic feeding device. The cement feeder revolves between concave plates. The sand or gravel feeder is surmounted by a roll held by stiff springs. This keeps the pocket full at all times but provides sufficient flexibility to prevent large, coarse material from catching. A spiral agitator turns above the sand feeder, insuring a feed even in damp or wet sand. Different proportions are obtained by putting in or removing plates in the pockets of the cylinders. The materials fall together from the feeders to the horizontal mixing trough. They are then taken up by 36 mixing blades arranged on a longitudinal shaft. The materials are dry mixed until they get about half way through the trough, when water is added and they are wet mixed until discharged at the end. The mechanism is driven by gas or steam engine, with belt and idler pulley allowing instant stopping of feeders and mixing shaft without stopping the engine.

Eureka Machine Co., Lansing, Mich. are the manufacturers.

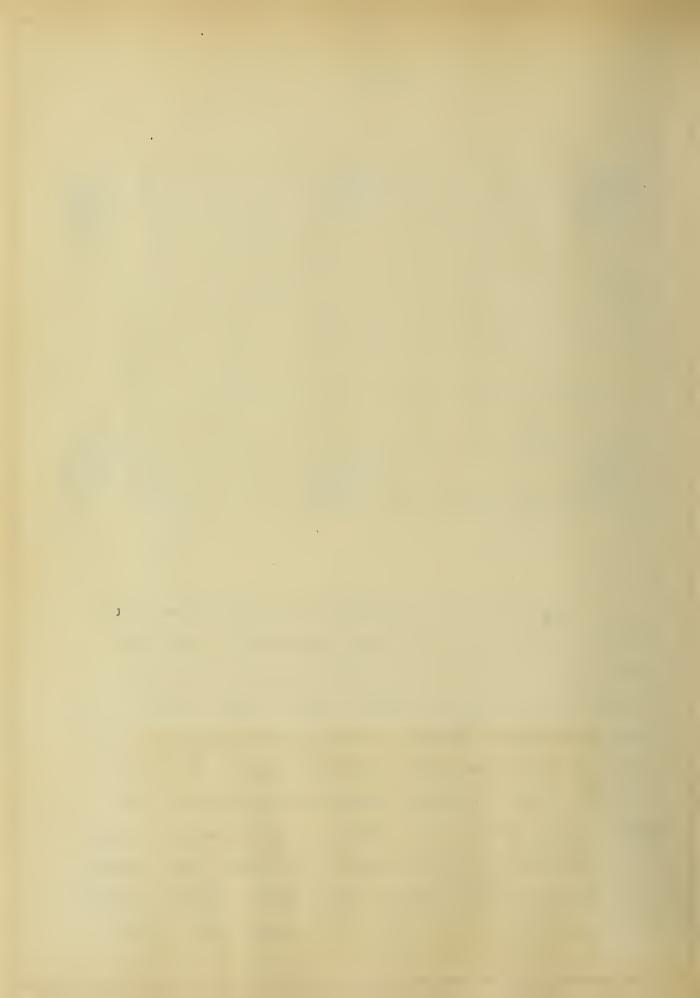
No.	Capacity Cu. yds Per hr.	Power	Price
81	8-15	St. Eng.	\$750
83	8-15	Gas	600
85	8-15	Motor	625



GRAND.



The Grand Continuous Mixer is a combination of the pocketed cylinder and the reciprocating pocket type. The cement is fed from the center hopper by a pocketed cylinder directly into the mixing trough. The two outside hoppers for sand and gravel are movable. These movable hoppers are connected at their lower sides and placed above a stationary bed plate, having a central opening directly beneath the cement hopper, and they are mounted on wheels which traverse a track journaled to the outside of the hoppers and supported from the bed-plate by brackets at its ends. There are openings in the lower part of the sides of the hopper next to the



central opening. As the hoppers move to the right, a quantity of the material in the right hand hopper is struck off. As they move back to the left, this quantity is shoved off into the mixing trough while a quantity of material from the left hand hopper is struck off. The amount of these charges is regulated by the adjustable openings in the sides of the hoppers.

The mixing takes place in a horizontal trough and is accomplished by heavy steel blades set upon a longitudinal shaft.

All machines are equipped with a friction clutch.

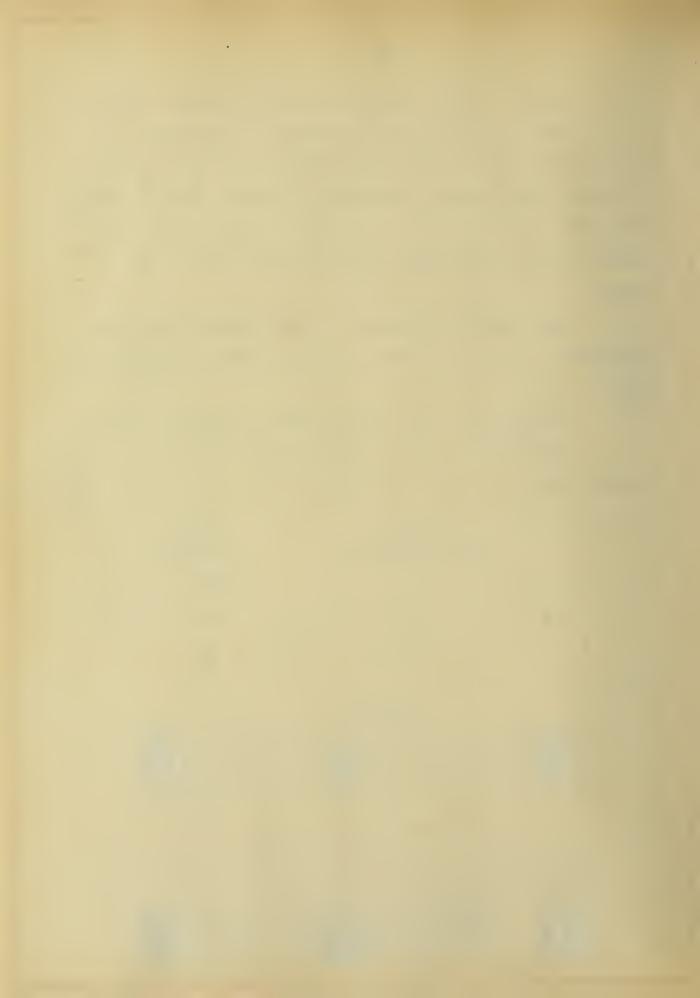
Hall-Holmes Mfg. Co. Jackson, Mich. are the

manufacturers.

No.	Capacity Cu. yds. per hr.	Price Gas Eng.
1	3-6	\$325
2	5-10	425
3	10-15	550

CRESCENT.





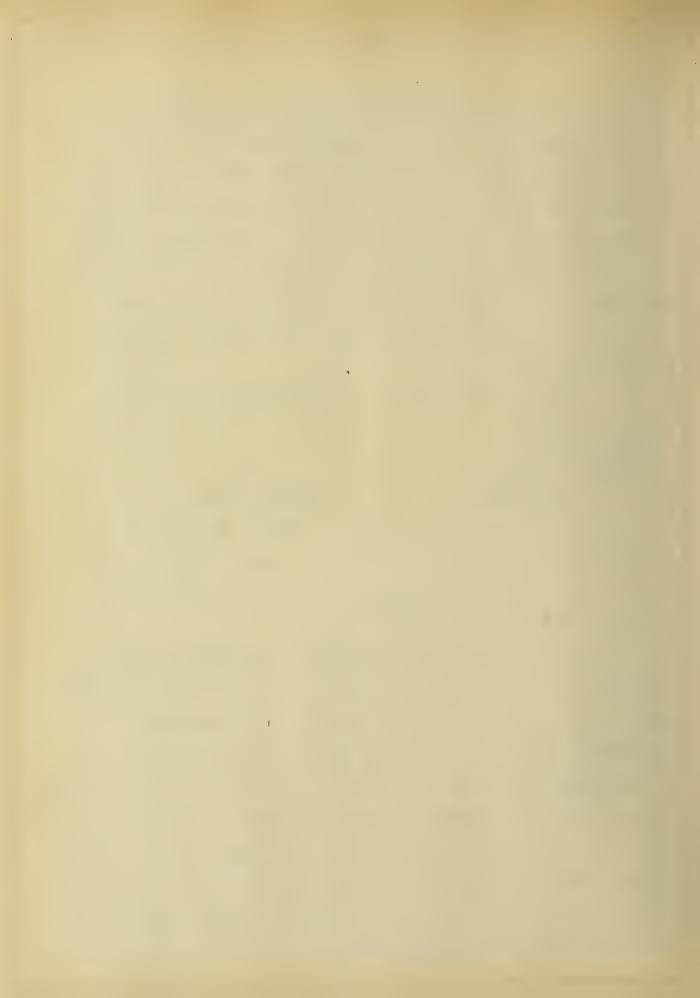
The Creecent Continuous Mixer is of the pocket cylinder type. The proportion can be changed while the machine is running, by means of the proportioning spool. This is shoved in or out, a scale on the sleeve showing the proportion obtained. The mixing is done in a horizontal trough, the paddles are larger and fewer in number than in most mixers. The feed hoppers are rather high as the mixer is so mounted that the front wheels can turn under the platform. The mixer is chain driven.

Raber & Lang Mfg. Co., Kendallville, Ind. are the manufacturers.

No.	Capacity	Price		
	Cu. yds./hr.	Gasoline Engine		
1	2-3	\$235 (2 hoppers)		
2	6-7	345		

COCKBURN.

The Cockburn Continuous Mixer stands in a class by itself. It has no automatic measuring device but the materials must be shovelled into the one hopper in the proper proportions. Around the top of the hopper which is 5 feet 8 inches from the ground, a platform is usually built upon which the materials are dumped. A worm screw feeds the materials into the square tumbling box. The tumbling box is on a slight incline from the hopper. This fall, together with the pushing action of the worm screw, is sufficient to give a steady yield of concrete at the discharge end.



Water is admitted to the tumbling box by a one inch pipe from which it is sprayed.

This machine is adapted to very large jobs only, where concrete can be taken care of in large quantities. It is made in only one size.



Cockburn Barrow & Machine Co., Jersey City, N.J. are the manufacturers.

> Capacity Cu. yds. per hr. St. Eng.

> > 25-30

Price

\$1150



FOOTE.



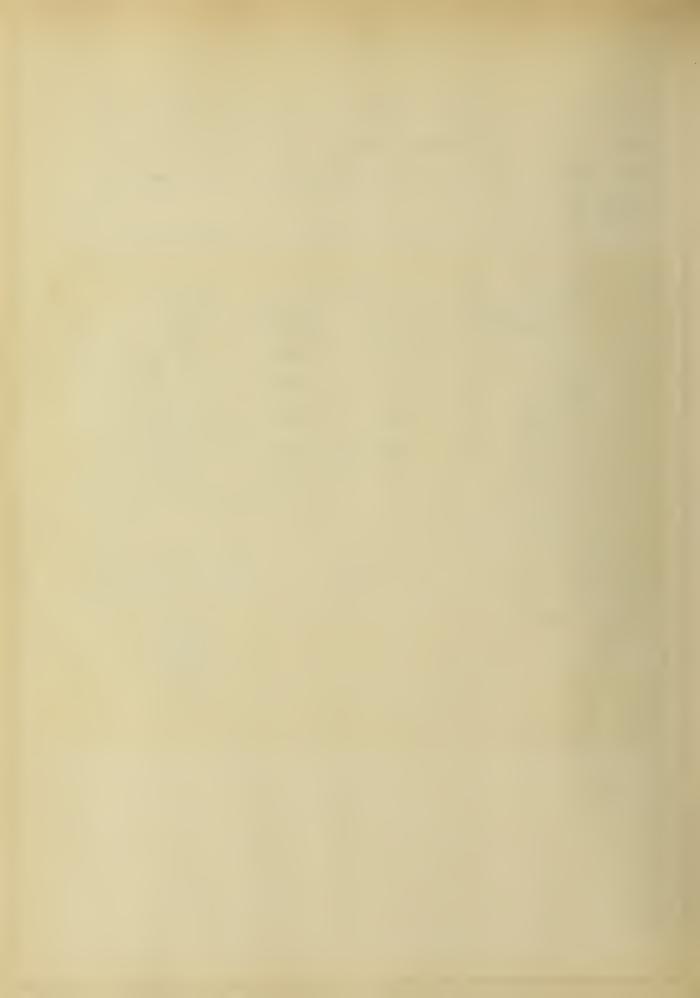
The Foote Continuous Mixer is of the worm feed type. The two outside feed hoppers are for sand and gravel or crushed stone. The middle one is for cement. The proportioning is accomplished by the screw worms placed in the bottoms of the hoppers. The proportion can be varied by changing the sprockets which drive the screw worms. The worms being at nearly the same level as the bottom of the mixing drum makes it possible to equip the mixer with very low charging hoppers. The mixing takes place in the horizontal drum and



is effected by 24 mixing wings attached to the shaft by steel arms. The material when half way through the drum is wet by spray pipes and wet mixed until discharged. The mixers are driven by a chain belt.

Foote Mfg. Co. Nunda, N.Y. are the manufacturers.

No.	Capacity Cu. yds.tamped	Price Gas.Eng. St. Eng.		Motor
	concrete		& Boiler	
1	6	\$725	\$750	\$750
2	7	825	850	875
2 1/2	12	1075	1075	1100
3	16	1325	1375	1400
4	25		1750	1800



PERFECTION.



The Perfection Continuous Mixer belongs to the pocketed cylinder class. The cylinders each have several pockets or compartments covered with slides held in position by set screws. By simply loosening the set screws you can



open or close as many compartments as necessary to give the desired proportions. One shape of mixing paddle is used throughout. It is double ended so that one end throws the material forward and the other end throws it back half way. The material is turned 15 times in the dry mix, 10 times while receiving water and 10 times wet. The mixer is gear driven. The sand and gravel hoppers are 52 inches from floor level.

The Cement Tile Mach. Co., Waterloo, Ia. are the manufacturers.

No.	Capacity Cu. yds. hr.	Price Gas Engine
1	3-4	\$ 300
2	5 -7 $\frac{1}{2}$	435

SIMPLEX.

The Simplex Continuous Mixer is equipped with the endless belt conveyor feed.

A three compartment hopper is used. Cement is placed in the center and sand, crushed rock or gravel fed into the outside hoppers. The proportion is governed by raising or lowering sliding doors in the lower part of the rear side of the hopper.

The distinctive feature of the Simplex Mixer is the revolving drum. At the upper end of this drum, which inclines about 15° to the rear, blades are riveted on the inside longitudinally. These carry the materials well up the sides



by gravity until they encounter a set of agitators which revolve in the opposite direction to the drum and at a higher speed. At this point water is added from a spray pipe and a wet mix is obtained from this point to the discharge end of the drum.

Only one size of machine is made.



The Miles Mfg. Co. Inc., Jackson, Mich. are the manufacturers.

Capacity Cu. yds. per hr.

7-10

Price Gasoline Engine

\$ 325



GAUNTT.

The Gauntt Continuous Mixer is of the worm gear type.

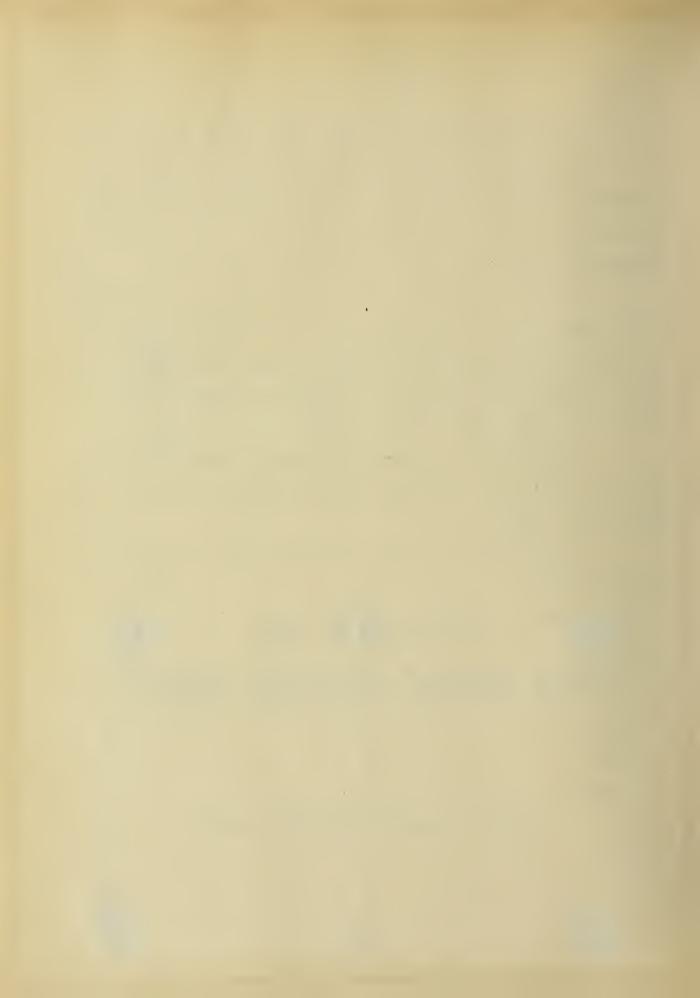
The feed worms are turned by a double ratchet. The ratchets are operated by slotted adjusting heads, by varying the position of the crank pins. In this way it is possible to vary the speed of the worms from zero to full speed.

The three materials feed continuously into the trough at the same place and are mixed by 36 paddles which revolve on a shaft. The materials are carried along and mixed dry for 34 inches. For the next 38 inches the mixture is wet by means of spray pipes and wet mixed.

These machines are built entirely of steel and are extremely well made. The sand and stone hoppers are 48 inches from the ground.

F. G. Gauntt, Mfg. Co., Ft. Wayne, Ind. are the manufacturers.





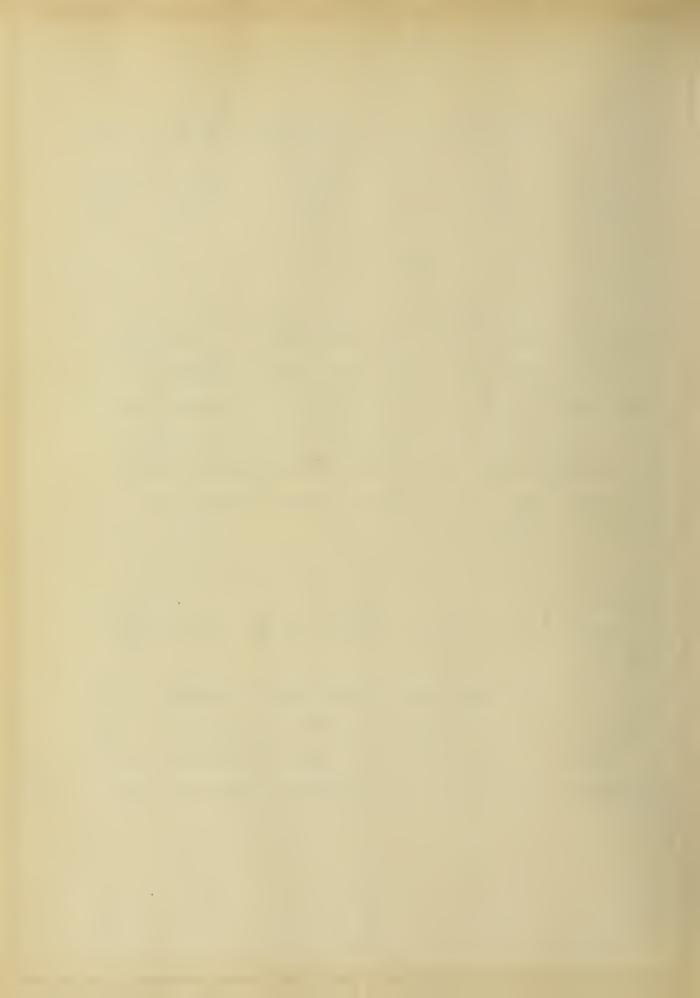
No.	Capacity Cu. yds. per hr.	Steam Eng. & Boiler	Price Gas Eng.	Motor
2	6	\$7 25	\$650	\$625
3	10	825	750	725

KENT.

The Kent Precision Continuous Mixer has the reciprocating pocket feed. The feeding device is operated by an adjustable fulcrum to control the length of stroke of the plate which reciprocates as the bottom of the hoppers into which the sand, stone and cement are placed. The hoppers are so arranged that the material is continuously working to a larger area. The adjustable fulcrum obviates the necessity of changing the feed gates.

The sand and cement drop into the trough at the same place and dry mixing immediately begins. More than half the length of the trough is used for the dry mixing of the sand and cement.

The water and crushed rock enter the trough a little beyond the center. One water spray discharges directly into the trough and the other into the crushed rock wetting the fragments so that the dry mix immediately adheres to them.

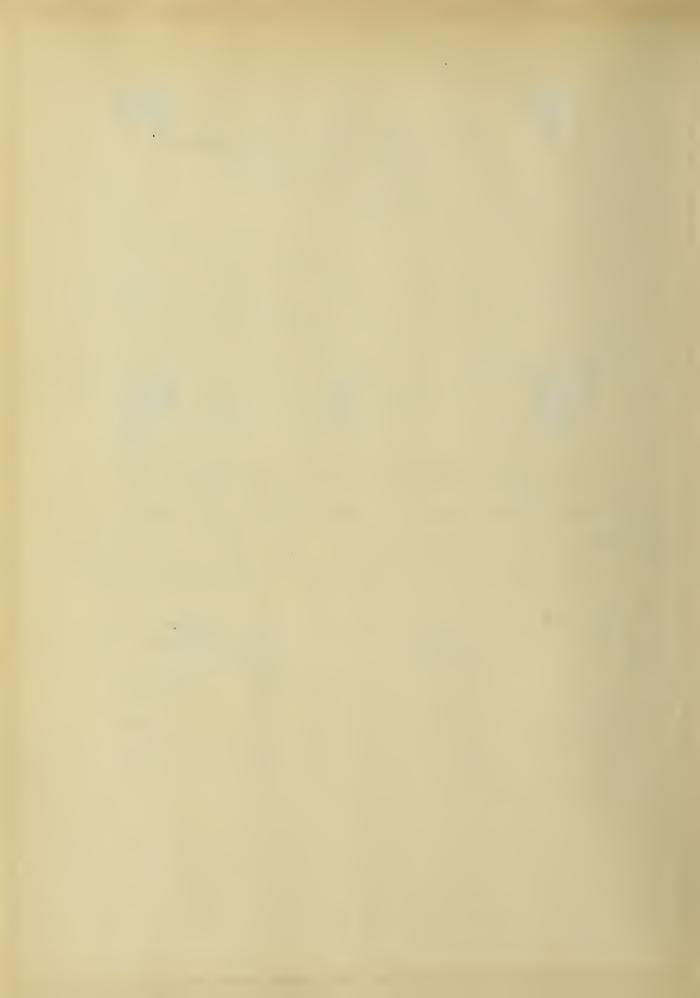




The mixing paddles are rather small and there is a large number of them which is a good feature. The hoppers are about 50 inches from the ground. The mixer is chain driven.

The Kent Mach. Co., Went, Ohio are the manufacturers.

No.	Capacity Cu. yds. rammed concrete	Price		
		St. Eng. & Boiler	Gas. Eng.	
2.	4	\$400	\$350	
2 1/2	7 <u>1</u>	585	550	
3	10	850	850	



COLTRIN.

The Coltrin Continuous Mixer has a feed of the reciprocating pocket type. The pockets on each side are operated by one sliding part which moves forward and back on rolls, acting as a plunger for delivering sand, rock or gravel and at the same time it operates the cement pocket in a similar manner. This device works very well if the gravel or crushed rock is of uniform size.

A distinctive feature is found in the mixing device. The mixing is done by blades $1 \frac{1}{2}$ " x $\frac{7}{16}$ " x 5' long extending in a spiral from head to foot of mixing trough. There are eight of these blades which are bolted together in the form of a cylinder which revolves 30 times per minute.

The trough is inclined about 15°. This feature together with the fact that the front wheels are designed to turn under the frame, makes the feed hoppers high above the ground.







The mixer is gear driven.

The Knickerbocker Co., Jackson, Mich. are the manufacturers.

No.	Capacity Cu. yds. per hr.	Price Gas. Engine
14	4-20	\$ 425
13		265
12	3-16	400
9		325
7	4-6	250
5		140



NATIONAL.



The National Continuous Mixer belongs to the plunger feed type.

The plungers are driven by pitmans bolted eccentricly to gear wheels. By moving the end of the pitman toward or away from the hub, different proportions are obtained.

A distinctive feature is the revolving drum into which the materials are fed. This drum is gear driven. It is equipped with 20 deflectors which carry the material upward and forward. Dry mixing is carried on about half way through the drum. Water is then added and the material wetmixed until discharged.

National Mixer Co. Rochester, N.Y. are manufacturers.



SYSTEMATIC.



The Systematic Continuous Mixer has the reciprocating pocket feed.

The adjustment of the proportioning is accomplished by changing the size of the pocket, by means of a screw which is kept locked in the desired position by a padlock.

This machine is gear driven and not a spring, chain or sprocket is used upon it. It is substantially constructed of steel throughout. The front wheels turn under the mixer which is a good feature provided the height of hoppers above the ground is not increased on account of it.

Cement Machinery Co., Jackson, Mich, are the manufacturers.



No.	Capacity Cu. Yds. per hr.	Price Gas. Engine
A	3	\$310
ΛA	4	325
В	6	360
BB	8	375
С	10	460

LOADING ATTACHMENTS.

The past few years have witnessed remarkable developements in the line of loading devices for batch mixers, intended to make their action more continuous.

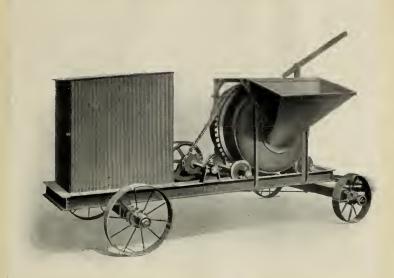
The attachments may be classified under three heads viz:

Batch hoppers, power loading skips and a combination of
the two.

Batch Hoppers.







On the non-tilting type of tatch mixers, the batch hopper is fastened upon the charging end of the machine, a gate or door operated by a lever closing the opening into the drum. One batch of material is placed in the batch hopper while another batch is being mixed. As soon as the mixed batch is discharged from the drum, the door is opened and the material runs into the drum ready to be mixed.

The batch hopper is best adapted where the mixer is placed below the ground level or where the material can be loaded into the hoppers from a higher level, as from flat cars or with derricks and buckets.



Power Loading Skips.

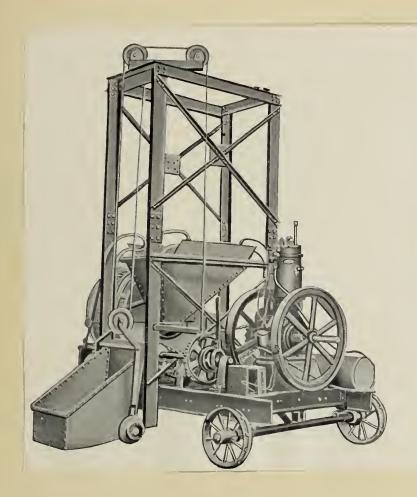


Power loading skips are adapted for use where the material to be mixed is on the ground or rather on the same elevation as the bottom of the mixer.

The skip is lowered to the ground and loaded with either shovels or wheelbarrows while one batch is being mixed. As soon as the batch in the mixer is discharged the skip is raised by the hoisting mechanism and the mixer recharged.



Combination Batch Hopper and Power Loading Skip.This device is adapted for use on very large mixers where a large gang of men are used.

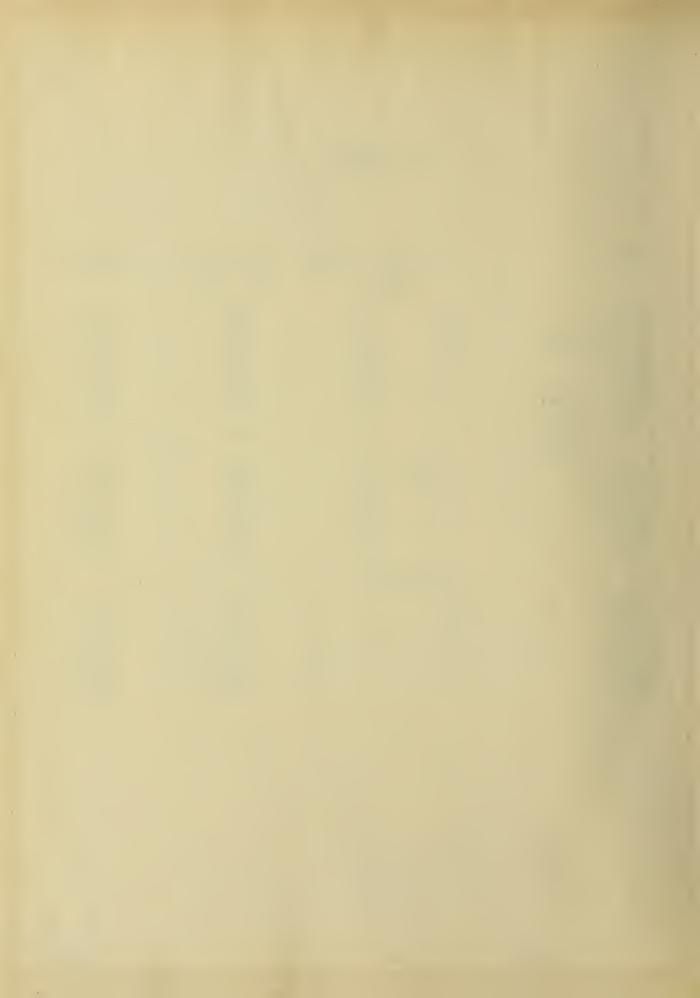


A batch in the mixer, a batch in the hopper and a third making up in the skip is the way it works. Two skips can be used if desired, one on each side with a gang for each skip.



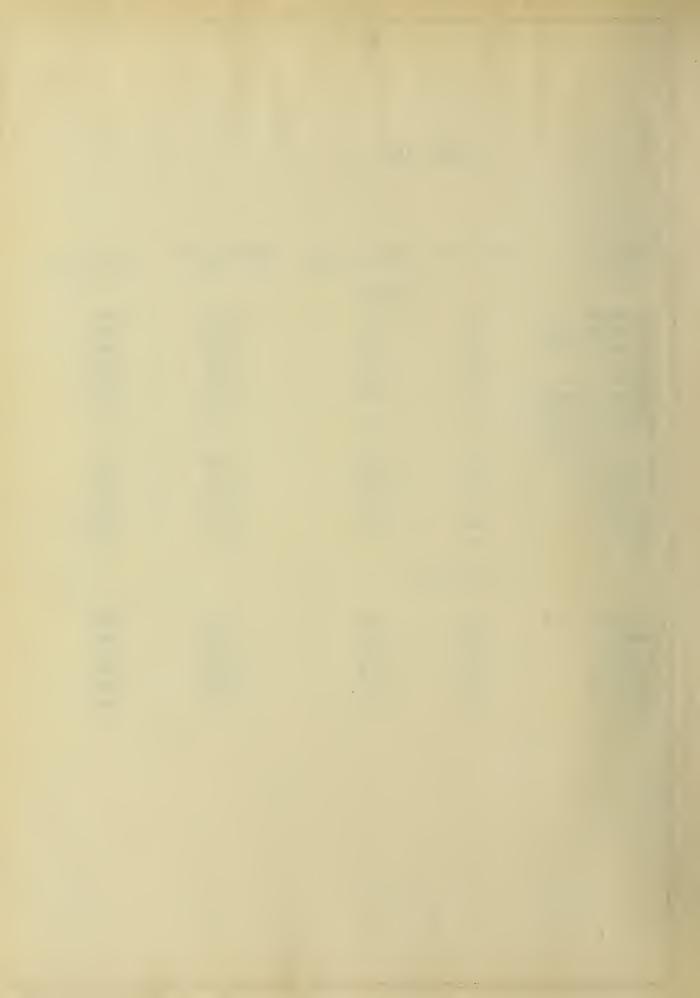
COST DATA.

Mixer		ze of tch Cu.Yds	Output per day of 10 hrs. Cu. Yds.	Cost of Mixer
Chicago	14	1/2	130	\$ 835
Chicago Cube	17	1/2	160	1250
Clover Leaf	15	1/2	120	850
Foote	6	1/2	125	1025
Hains		2/3	200	500
Marsh-Capron Non-Tilting	2	1/2	130	1060
Marsh-Capron Tilting	2	1/2	130	1010
Koehring	1 1/2	1/2	150	1000
Milwaukee	1 1/2	1/2	160	970
Polygon	1	1/2	80	825
Ransome	14	1/2	125	900
Smith	11	1/2	140	875
Snell	3	1/2	160	800
CONTINUOUS				
Eureka	81		120	750
Foote	3		160	1400
Gauntt			120	750
Coltrin	14		120	425
Simplex			100	325
Grand	3		120	550



COST DATA

Mixor	No. Men	Interest on cost per hr. BATCH	Depreciation per hour	<pre>cost of Mixing per Cu. Yd.</pre>
		DATOII		
Chicago	22	3.031	\$.104	\$.348
Chicago Cube	28	.041	.195	.366
Clover Leaf	20	.032	.133	.348
Foote	18	.039	.128	.331
Hains	20	.019	.063	.204
Marsh-Capron Non-Tilting	22	.040	.133	.352
Marsh-Capron	22	.038	.157	.354
Tilting	25	070	105	72.4.1
Koehring		.038	.125	.344
Milwaukee	25	.036	.121	.322
Polygon	16	.031	.129	.421
Ransome	22	.034	.113	.363
Smith	24	.033	.137	.356
Snell	25	.03	.125	.323
	CONTINUC	ous		
Eureka	14	.028	.094	.244
Foote	18	.053	.175	.240
Gauntt	14	.028	.094	. 244
Coltrin	16	.016	.053	.272
Simplex	12	.012	.014	.245
Grand	14	.021	.069	.241
W = -44.5	ulu h	4 (2.10 m)	4000	****



This cost data table gives the name and number of the mixer, size of batch in case the mixer belongs to the batch type, output per 10 hour day in cubic yards, cost of mixer, number of men required to feed mixer and remove concrete to forms, interest per hour on cost of mixer, depreciation per hour and cost of mixing per cubic yard.

The output of the mixer is the manufacturer's rating. The writer has had an opportunity to check but very few of these from other sources but in so far as he has observed or found out from reliable sources the manufacturer's ratings are very nearly right.

The number of men has been estimated after a careful study of each machine. In this estimate the writer has based his opinion upon his personal experience and upon data published in engineering and contracting journals.

In calculating the interest per hour on the cost of the mixer, it has been assumed that the mixer is in use twenty, ten hour days for eight months per year. The rate of interest assumed is six per cent.

In calculating depreciation per hour, it is assumed that continuous mixers and batch mixers of the non-tilting type deteriorate twenty per cent per year and that the tilting type of batch mixer deteriorates twenty five per cent per year. This discrimination is made for the reason that in the tilting mixers, large eccentric stresses are developed. In the opinion of the writer, the effect of these will be sufficient to shorten the life of the mixer one year.



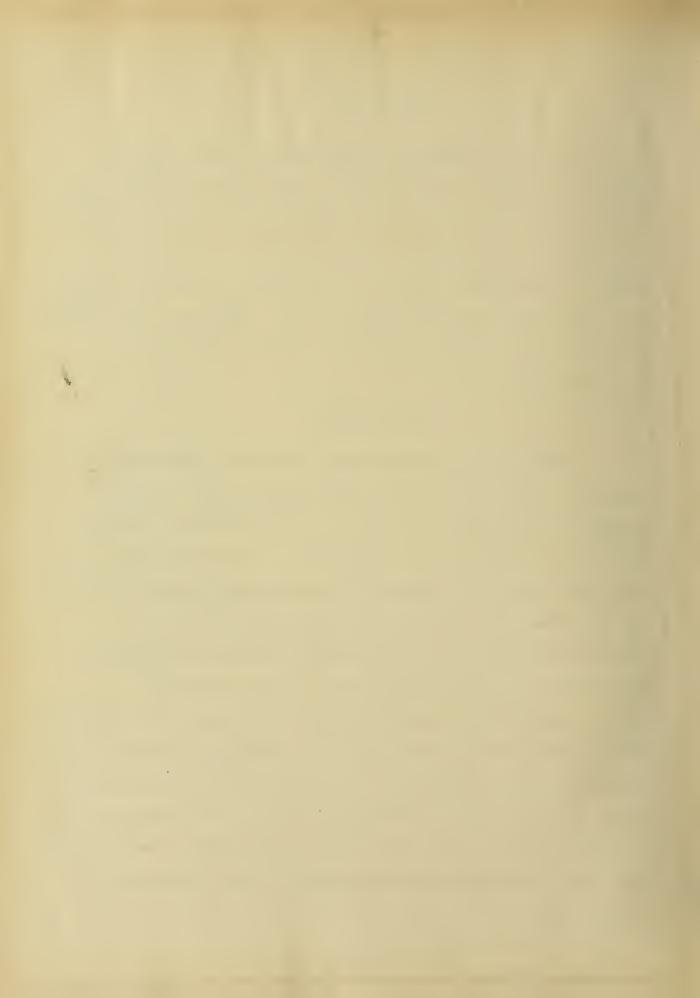
CONCLUSION.

It is not possible to pick out one mixer and say that it is the best of all mixers. Much depends upon the conditions under which the mixer is to be used and upon the purpose for which it is to be used. It is, however, possible to compare the different mixers of each general class and arrive at a conclusion as to which one is best. Therefore the writer will handle the subject in that way and the following are his conclusions.

BATCH MIXERS.

Of the revolving-drum type the non-tilting style is the best. The operation of tilting causes large eccentric stresses to be developed, which is an objectionable feature. Taking into consideration, simplicity, construction and economical mixing of concrete, the Milwaukee appears to be the best revolving drum batch mixer. The Foote which is better constructed and just as simple but which is a little less economical, is about the equal of the Milwaukee.

The gravity type of mixer is by far the most economocal batch mixer but it is not adapted to different conditions like the revolving drum type. For large, deep foundations or piers, for sewer work and other work where the concrete is to be placed below ground level, the gravity mixer is best adapted. The Hains is the only important mixer of this type upon the market today.



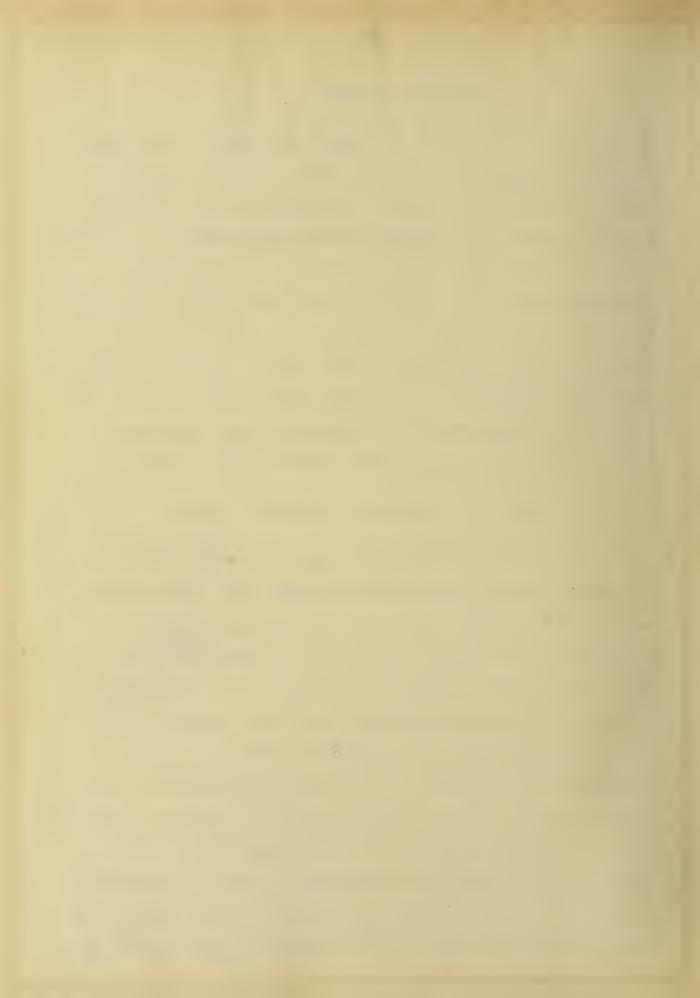
CONTINUOUS MIXERS.

with the screw feed. This is the most durable and positive type of feed and will require less attention than any other.

Low feed hoppers and a device for thorough mixing are necessary. The mixer should also be well constructed and should mix concrete economically. The Foote Continuous Mixer appears to be the best of its kind. It has all the qualifications mentioned above as essential. There seems to be very little difference in regard to economical mixing between any two of the best continuous mixers, but the Foote Mixer appears to have a slight advantage over the others in this respect.

COMPARISON OF BATCH AND CONTINUOUS MIXERS.

In the past, continuous mixers have been restricted to use on pavement, foundations and other work, either massive or of such a character that the best quality of concrete was not absolutely necessary. The batch mixer was used for this and also on roofs, tanks and walls where the concrete had to be uniform and as near waterproof as it was possible to make it. The objections to the continuous mixer were that the proportions, as measured by the automatic devices, were uncertain and that the mix was not thorough. The first objection has been entirely overcome in the best continuous mixers of today. In fact they have reached such a state of perfection that there can be no doubt but that they measure material much more correctly than they will be measured by ordinary laborers



with wheelbarrows or shovels. If the hoppers are kept full, the personal equation is eliminated entirely in the continuous mixer.

As regards the second objection, the argument is advanced that in the batch mixer every part of the batch has an opportunity to come in contact with every other part, while in the trough of the continuous mixer, the different parts of the troughful keep about the same relative positions to each other at all times, during the progress from one end of the trough to the other. While this is true it does not necessarily follow that the product of the continuous mixer cannot be just as thoroughly mixed as that of the batch mixer. The product of the continuous mixer is uniform in respect to consistency as well as to mixing. In the batch mixer one batch is liable to be undermixed and another over-mixed. It is also difficult to get uniform consistency, unless a measuring tank is used.

Regarding economy of mixing, the continuous type is superior to the batch. The average cost per cubic yard for the continuous is about \$0.25 and for the batch about \$0.35 a difference of 40%.

It is the writer's opinion therefore, that the best type of mixer to buy is the continuous, and that the best mixer of this type is the Foote.





